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Research on Piloting Agricultural Insurance Bundled with Solar Home Systems

Final Report

March 2024

Triple Line Consulting

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Background of the project funded by Shell Foundation

- Shell Foundation and FCDO provided funding to Pula, an insurtech company, to pilot an innovative product. Pula embeds insurance products with agricultural inputs, loans, and productive assets to help farmers and livestock owners adapt to the changing climate.
- The product piloted was an agricultural insurance bundled with solar home systems (SHS) that are typically purchased on credit. Bundling these products together was expected to help farmers to keep up with repayments, even during periods of low crop yield.
- For the pilot, Pula partnered with 3 off-grid solar energy companies across Kenya, Senegal and Uganda.

Research objective and methods

- The objective of the research was to understand the characteristics of solar companies' customers, their experience with crop failures and challenges in keeping up with payments for solar products.
- Key hypotheses behind the pilot: i) Farmers value their access to SHS products but sometimes struggle to keep up with repayments due to crop failures; ii) crop insurance could address the main reason for non-repayment and thus enable farmers to hold on to their SHS assets.
- Triple Line conducted analysis of data collected by Pula from farmers and triangulation with data from interviews with the 3 solar companies.

Summary of findings and lessons 1/2

- **The majority of customers in Senegal (83%), Kenya (68%) and Uganda (73%) are farmers** (primarily engaged in own vegetable production or livestock), with most farms smaller than 1 hectare
- **Crop failure was considered the primary reason for non-repayment by solar companies.** A significant majority of customers (93%) reported experiencing crop failure at least once, and 73% reported experiencing it at least twice, in the past 5 years
- **Reducing expenditure on energy was not a very common method of dealing with periods of poor harvest**: only 11% of all customers surveyed reported reducing their energy expenses, ranging between 17% (Senegal) and 3% (Kenya), thereby demonstrating how much customer value their access to solar assets
- Nevertheless, **crop failure was considered the primary reason for non-repayment by solar companies in Senegal (53%) and Kenya (83%)** this was backed up by customer data and correlation analysis:
  - In Senegal, in particular, a strong correlation was observed between crop failure and payment default
  - Across all three countries, there is a 3.8x increased likelihood of defaulting for 1+ months if you experienced crop failure

Summary of findings and lessons 2/2

- **Solar companies reported that defaults and repossessions have the biggest impact on their profitability**, therefore they use various means to reduce the likelihood of repossession, including amending payment terms or pausing contracts, downgrading to a more basic package, transferring ownership.
- **60% of customers surveyed in all three countries experienced challenges in keeping up with payments** or defaulted on payments.
    - Female customers were more likely to experience difficulties with payments than male customers, **however they were less likely to default on their payments (by 4% in Senegal) or having their assets repossessed (by 3% in Kenya)** .
- Solar companies did not decide on the payout strategy at the time of the study, which means that the **effects of the payouts on smallholder farmers could not be observed.**
- **Solar companies questioned the affordability of the bundled insurance for customers**. They are conducting further analysis and are still considering doing a second pilot at a different location to conclude their opinion on the product's viability.

Introduction

Background of the project funded by Shell Foundation

- Shell Foundation and FCDO provided funding to Pula, an insurtech company, to pilot an innovative product. Pula embeds insurance products with agricultural inputs, loans, and productive assets to help farmers and livestock owners adapt to the changing climate.
- The product piloted was an agricultural insurance bundled with solar home systems that are typically purchased on credit (through PAYGO system). Bundling these products together was expected to help farmers to keep up with repayments, even during periods of low crop yield.
- For the pilot, Pula partnered with 3 off-grid solar energy companies across Kenya, Senegal and Uganda.

Country	Product bundling and target customers
Senegal	• Not bundling products yet, assessing customer interest first to see if bundling would be feasible • Entire portfolio of customers covered in the pilot
Kenya	• Considering bundling lights and TV customers, but to scale, customers would need to be able to afford the insurance • 4,000 customers covered in the pilot, selected based on location, contract period, late payment history • Unsure how to distribute payments to customers
Uganda	• At pilot outset, unsure how to bundle and which customer groups bundle will be offered to. • May want to build insurance into the pricing of products going forward

Background to the Pilot – key data

Country	Number of farmers in the pilot	Gender breakdown (if available)	Age breakdown (if available)	Rural vs Urban (if available)	Crops
Senegal	12,401	Not available	Not available	Not available	Peanuts, Rice and Millet
Kenya	4,174	30% female 70% male	55% above 35 45% below 35	100% rural	Maize
Uganda	220,000	Not available	Not available	Not available	Maize, Sorghum, Millet, Soybeans, Beans and Cassava

The objective of the research was to understand the characteristics of solar companies' customers (farmers), their experience with crop failures and challenges in keeping up with payments for solar products

Key hypotheses tested: i) Farmers value their access to SHS products purchased on credit but sometimes struggle to keep up with repayments due to crop failures; ii) crop insurance could address the main reason for non-repayment and thus enable farmers to hold on to their SHS assets.

Research methods

- Triple Line conducted analysis of data collected by Pula from farmers (customers of the three participating off-grid solar companies)
- Triple Line interviewed solar companies before and after the pilot

Key research topics

- Who are the customers?
- What are the customers' energy needs?
- To what extent is repayment a challenge?
- What are the current default rates among customers and the reasons behind defaults?
- What are the consequences of those defaults for the solar companies?
- What are the solar companies' plans going forward?
- What are the lessons learnt from the pilot?

Customers

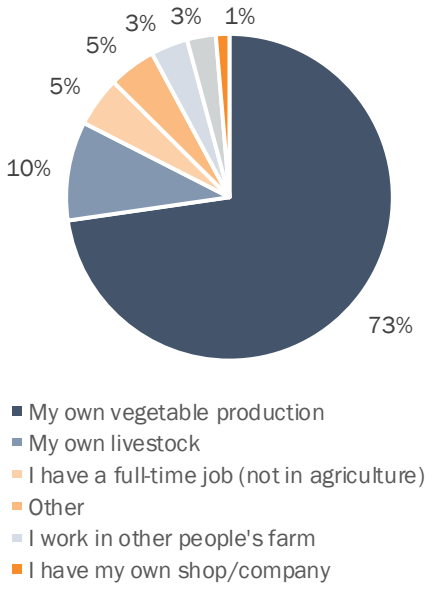
The dominant customer segment of off-grid solar companies is bottom of pyramid (BoP) customers: rural populations with primary source of income from agriculture

Assumptions tested	*Findings*
• Farmers are the main customer group of off-grid solar companies	• The dominant customer segments for the range of off-grid solar products offered by the interviewed companies are BoP customers. These **are primarily rural populations who earn their main income from agriculture.**
• There is pressure for solar companies to shift towards the middle-class customer segment	• None of the companies mentioned pressure to shift towards wealthier customer segments, even though it was noted that **the BoP segment is very sensitive to price increases.**

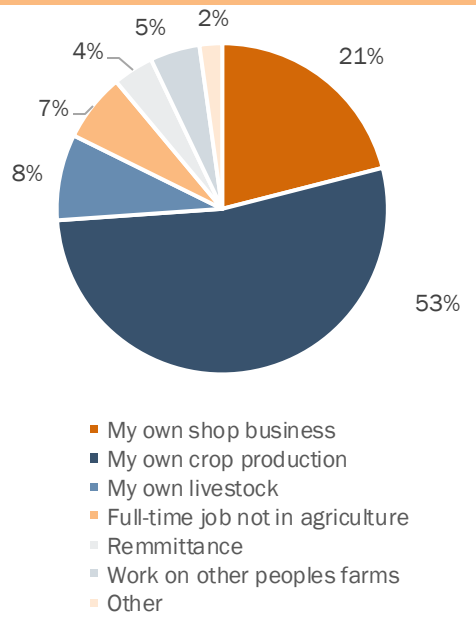
The majority of customers in all three countries are farmers (primarily engaged in own vegetable production or livestock), with most farms smaller than 1 hectare

What's your main source of income?

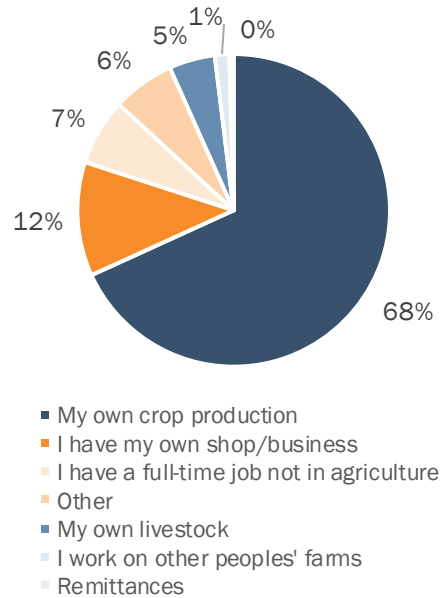
Senegal



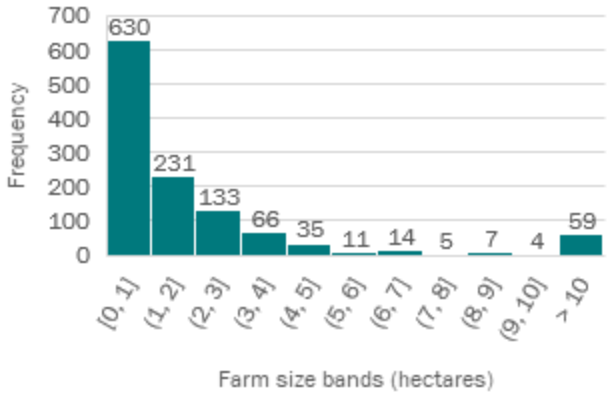
Kenya

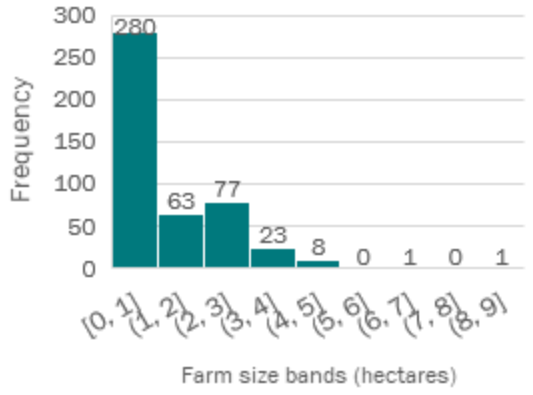


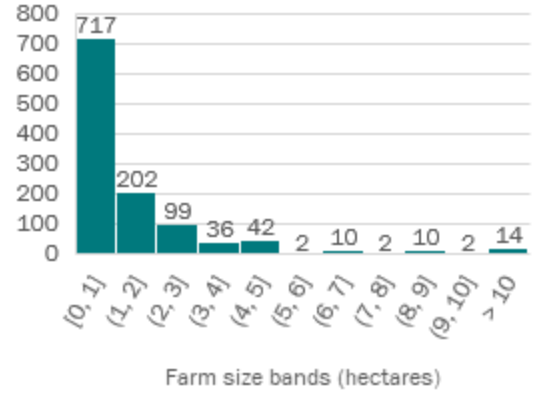
Uganda



How big is your farm?







Crop failure and repayment

Off-grid solar companies consider crop failure as the key driver of non-payment among their customers

Assumptions tested

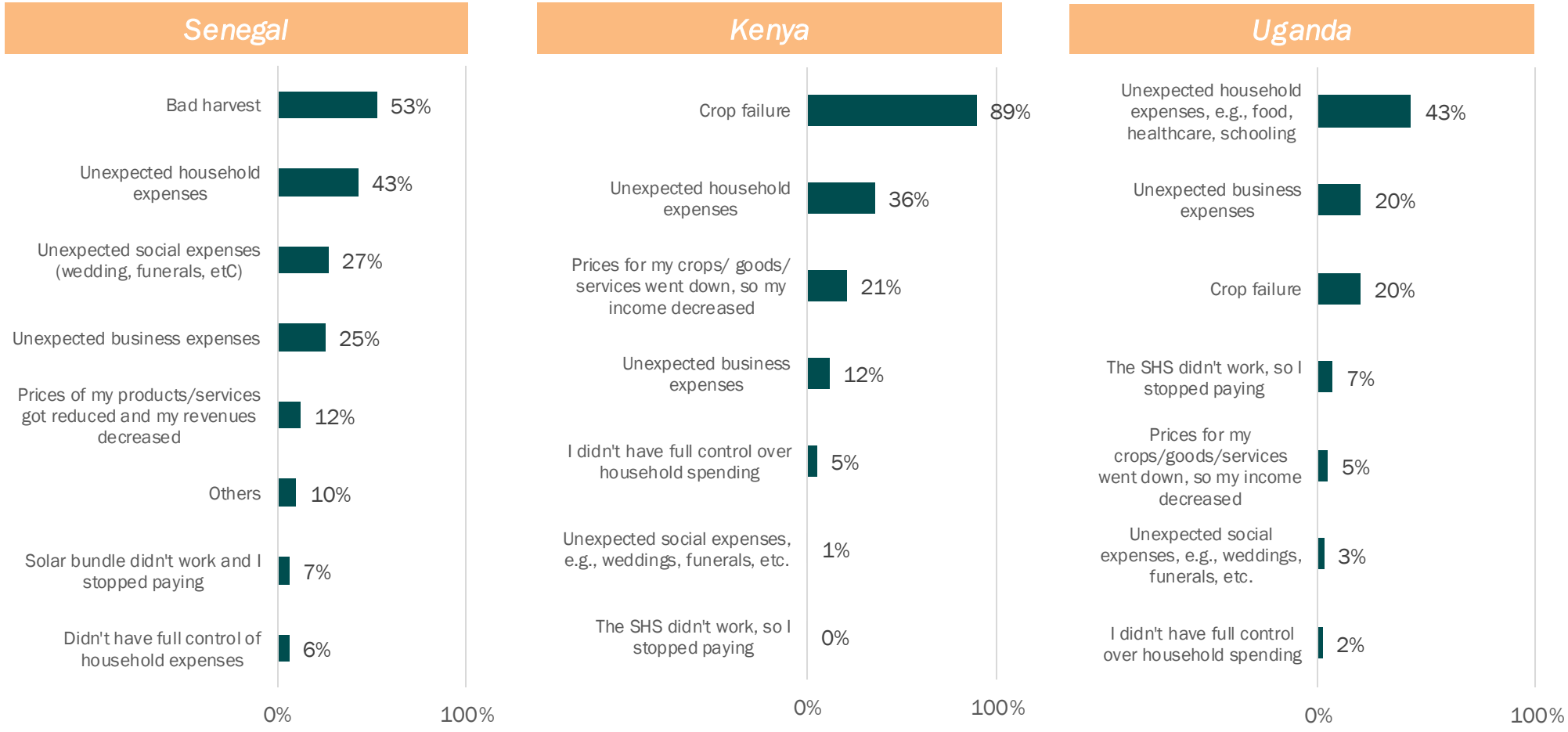
- Farmers value their access to SHS products but sometimes struggle to keep up with repayments due to crop failure
- Studies have shown higher customer default rates during the dry season and/or following poor yields, and when school fees are due

Interview findings

- Drivers of non-payment: payment delays are related to irregular revenue streams
  - All companies agreed that **poor yields is the most important cause of non-payment** – this corresponds with the findings from the customer surveys (see next slide).
  - They also mentioned the fluctuation of market prices of crops, unforeseen expenses (e.g. healthcare), technical fault with products and other macroeconomic factors as possible reasons for non-payment
- Solar companies think that when customers prioritise payments, **energy is preceded by basic needs and costs like payment of school fees.**

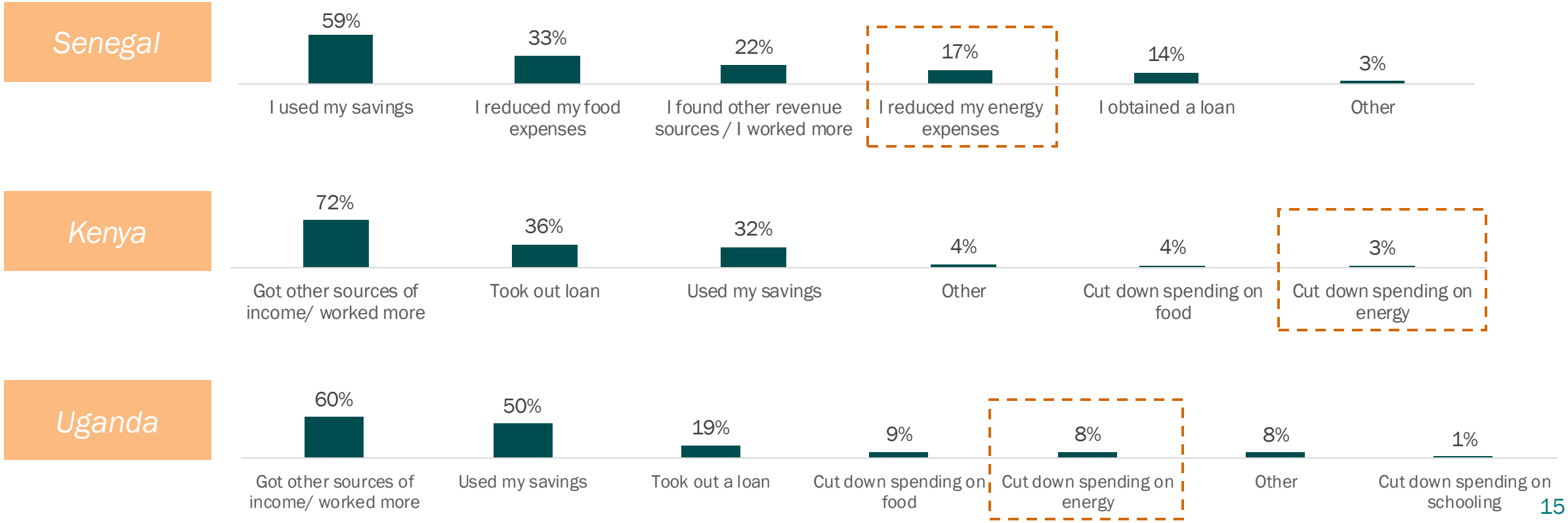
Crop failure and unexpected household expenses are the most cited reasons for challenges with repayment of SHS assets. Crop failure was the top reason of non-payment in Kenya cited by an overwhelming 89% of customers.

What was the main reason for your challenges with payments?



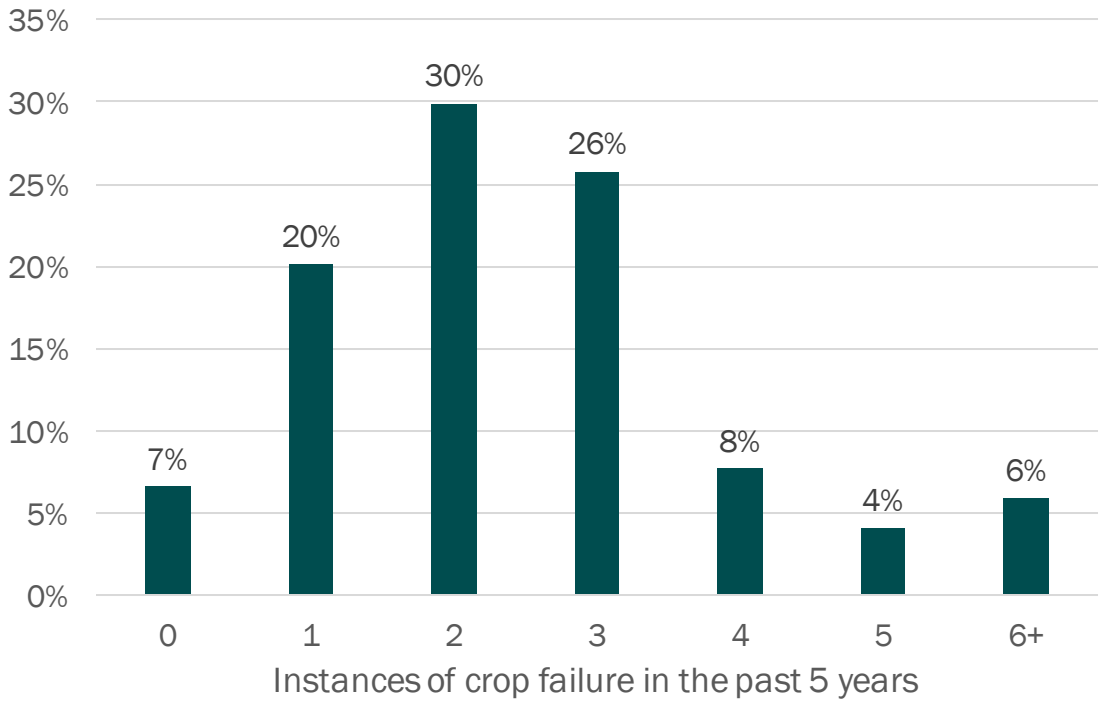
Most customers value their energy assets and use other coping mechanisms rather than cutting their energy expenses. Only 11% of all customers surveyed reported reducing their energy expenses, ranging between 17% (Senegal) and 3% (Kenya).

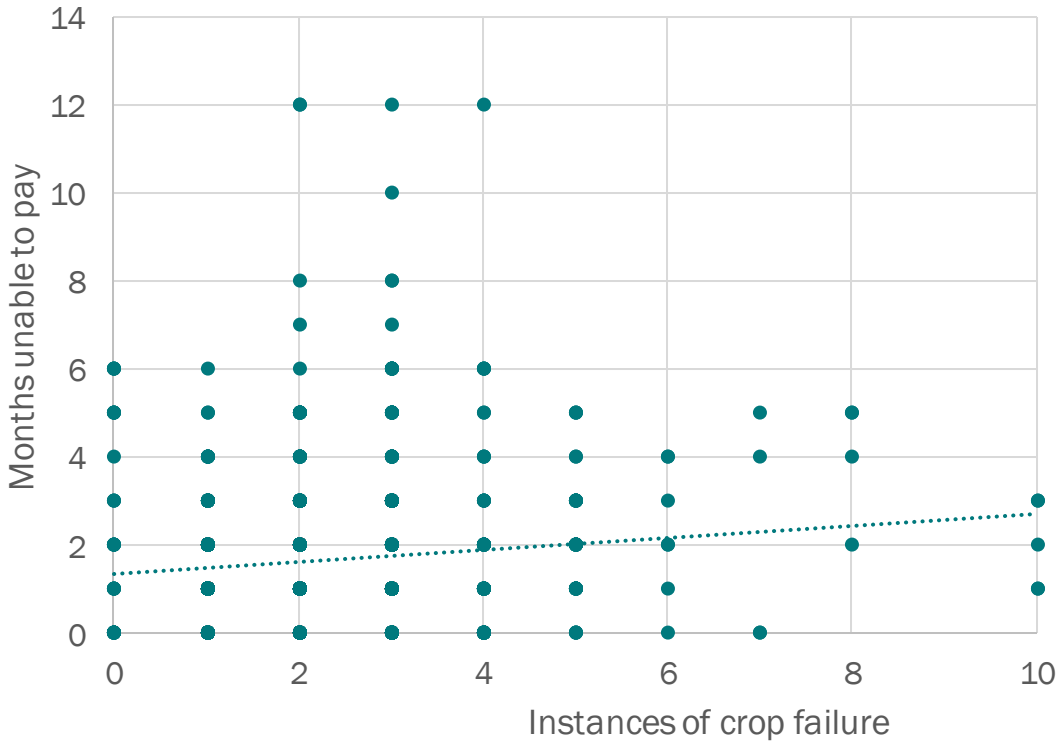
In years when you had a bad harvest, what did you do to cope?



A significant majority of respondents in all three countries (>93%) have experienced crop failure, with a slight positive correlation between frequency of crop failure in the last 5 years and the months unable to repay in the event of default.

Frequency of crop failure in the past 5 years



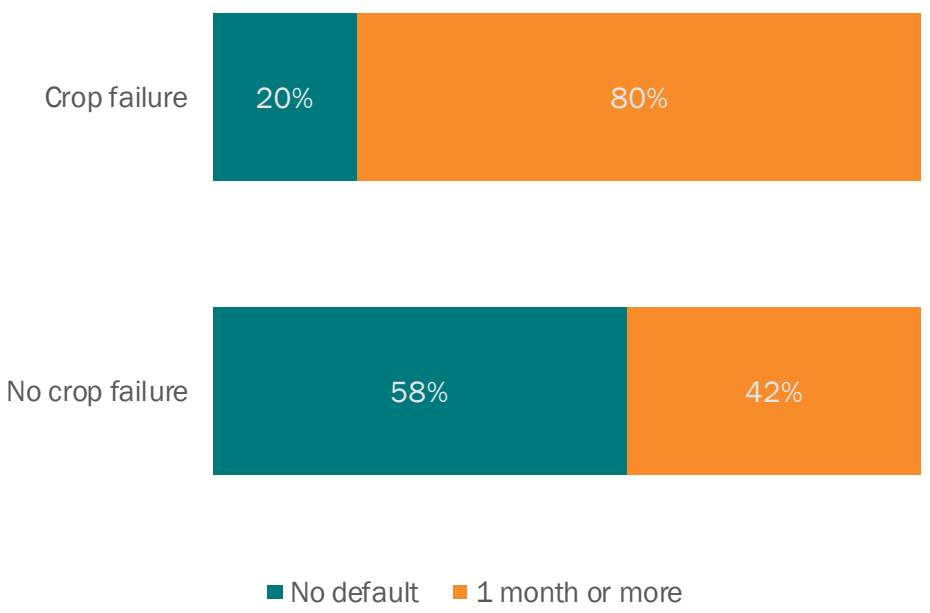


! *Please note that we do not have the definition of crop failure used by the enumerators*

Crop failure is incredibly common, affecting almost all customers in Senegal and Kenya and 80% of customers in Uganda at least once over the past 5 years

- Correlation between number of months struggling to repay and cases of crop failure is inconsistent across the three countries.
- There is strong correlation in Senegal (see diagram), where among farmers who reported experiencing crop failure, 80% reported defaulting on payments, while only 42% of those who had no crop failure reported defaulting.
- In Kenya, a slight positive correlation has been identified between increased instances of crop failure and months unable to repay in the event of default.
- In Uganda, the sample size was too small to infer any correlation.

Crop failure and ability to repay in Senegal



Summary of findings

- **A significant majority of customers (93%) reported experiencing crop failure at least once**, and 73% reported experiencing it at least twice, in the past 5 years
- **Reducing expenditure on energy was not a very common method of dealing with periods of poor harvest**: only 11% of all customers surveyed reported reducing their energy expenses, ranging between 17% (Senegal) and 3% (Kenya), thereby demonstrating how much customer value their access to solar assets
- Nevertheless, *crop failure was considered the primary reason for non-repayment by solar companies* – this was backed up by customer data and correlation analysis:
    - In Senegal, in particular, a strong correlation was observed between crop failure and payment default
    - Across all three countries, there is a 3.8x increased likelihood of defaulting for 1+ months if you experienced crop failure

Payments and defaults

Approach of off-grid solar companies to deal with late repayment and defaults

Assumptions tested

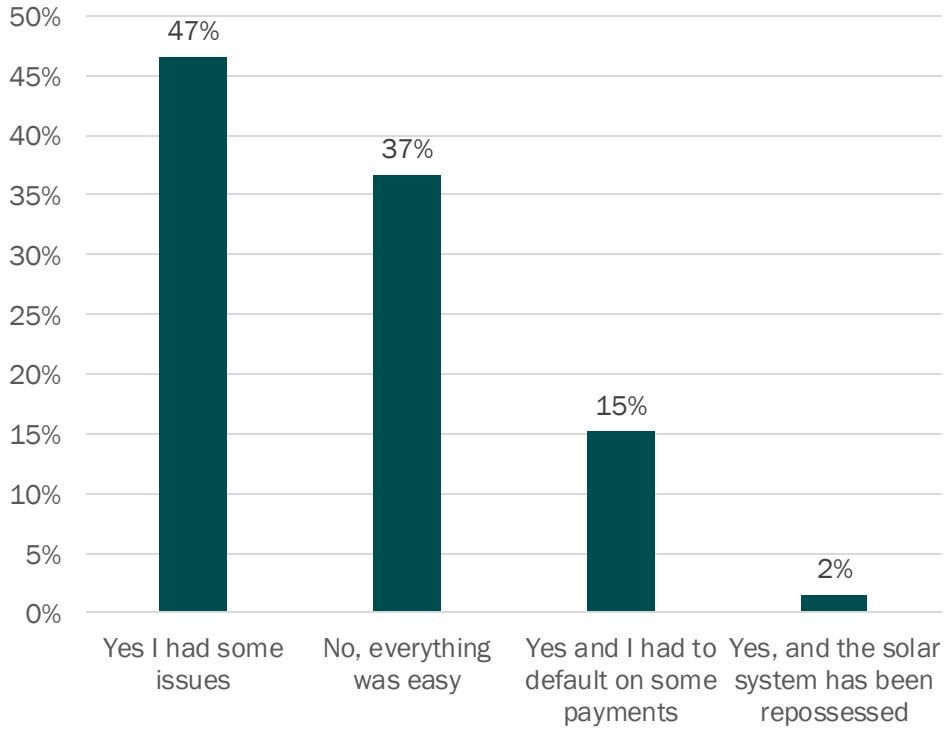
- Default is generally considered to be non-payment for 6-12 weeks, whereas a write-off follows from non-payment for 6 months.
- Some companies alter the payment terms to request bigger sums following harvests and smaller sums during dry season.

Findings

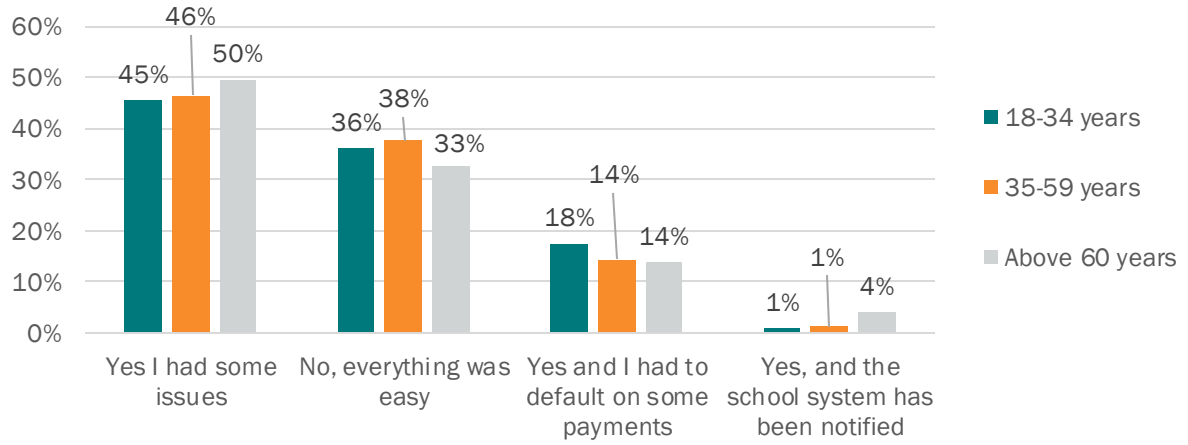
- Companies follow a similar approach: after appr. 60-90 days of inactivity, customers are considered to be in default. After 90-120 days, companies will repossess the products and refurbish them for resale when possible.
- Companies agree that **write-off of equipment has the biggest impact on their profitability**, Therefore they try to minimise repossessions and write-offs. when this can help customers keep up with repayments. Before repossession, companies tend to offer solutions:
  - Amend payment terms (e.g. reduce daily instalments and extend loan tenors),
  - Downgrade to a more basic package,
  - Transfer of ownership,
  - Voluntary repossession,
  - Pause contracts for a short period of time.

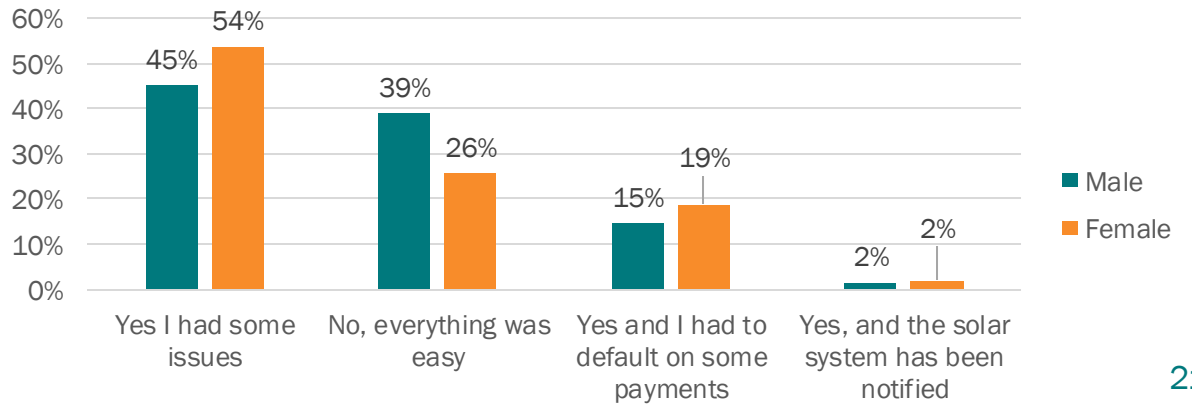
In Senegal, >60% of respondents experienced difficulties with payments, and 15% admitted to defaulting on payments*; female and older customers were more likely to struggle

Have you experienced any difficulties in keeping up with payments for your solar home system?



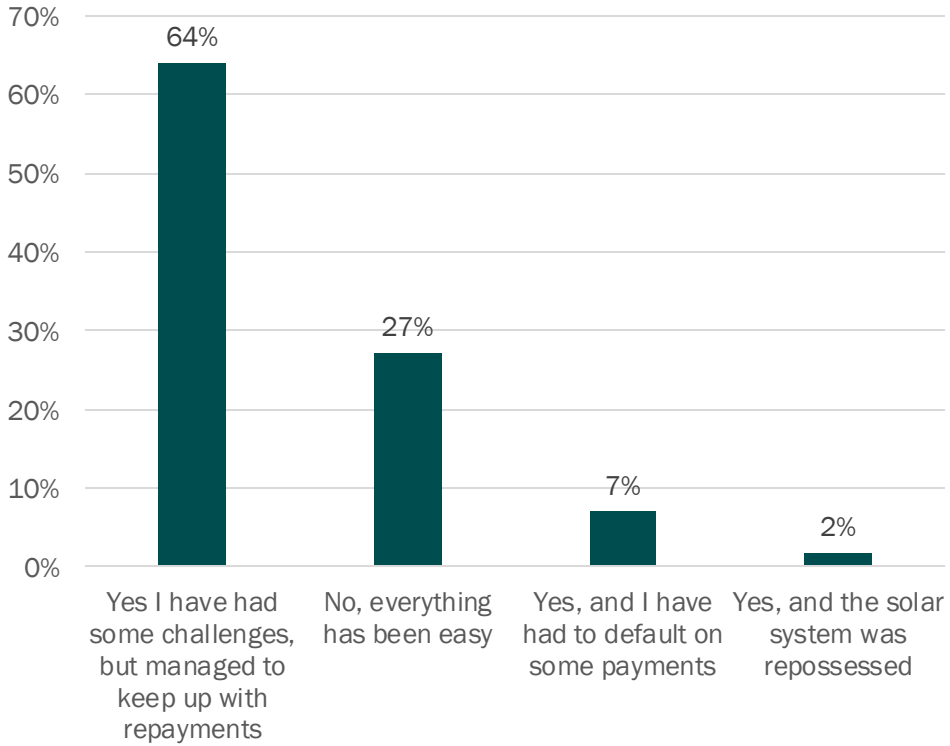
*this is a much higher figure than listed in the company reported data, which gives an estimate of 1.5%.



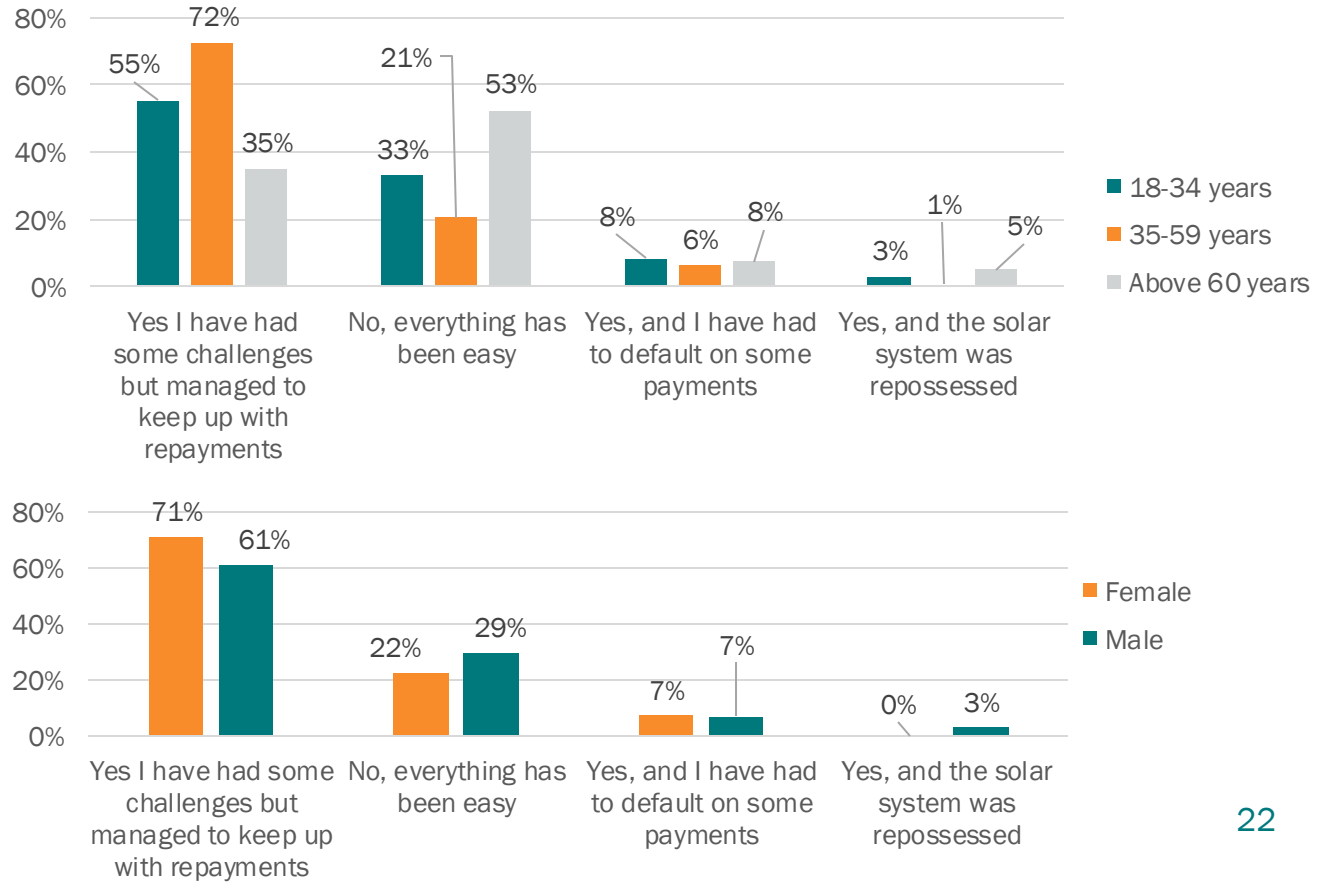


In Kenya, almost two-thirds of customers faced difficulties with payments, and 7% admitted to defaulting*; female and middle-aged customers were more likely to struggle

Have you experienced any difficulties in keeping up with payments for your solar home system?

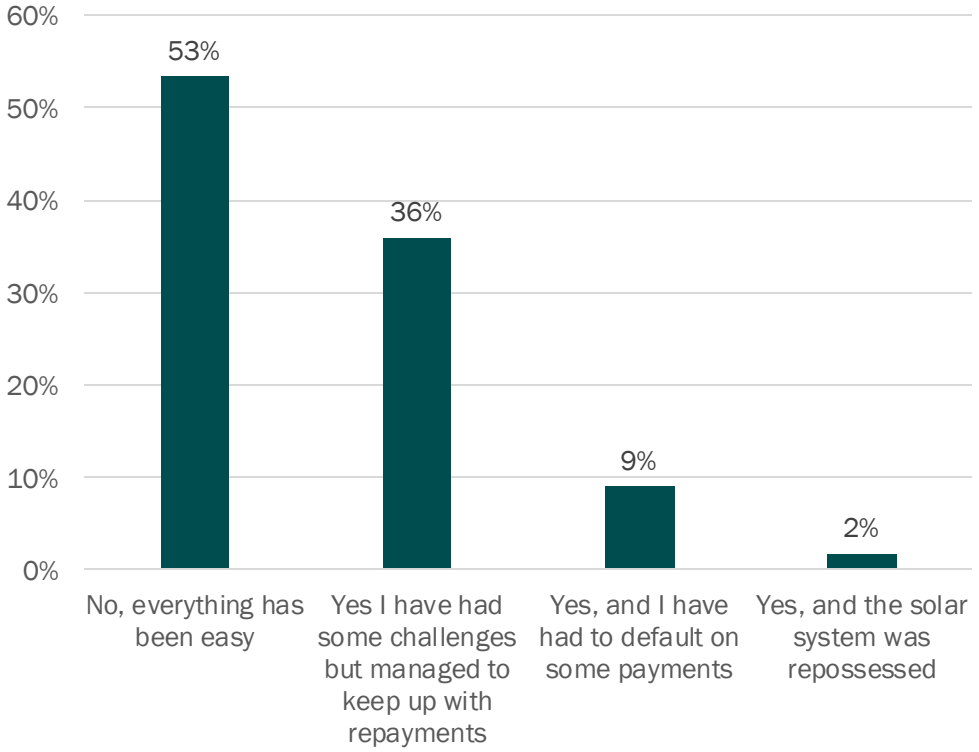


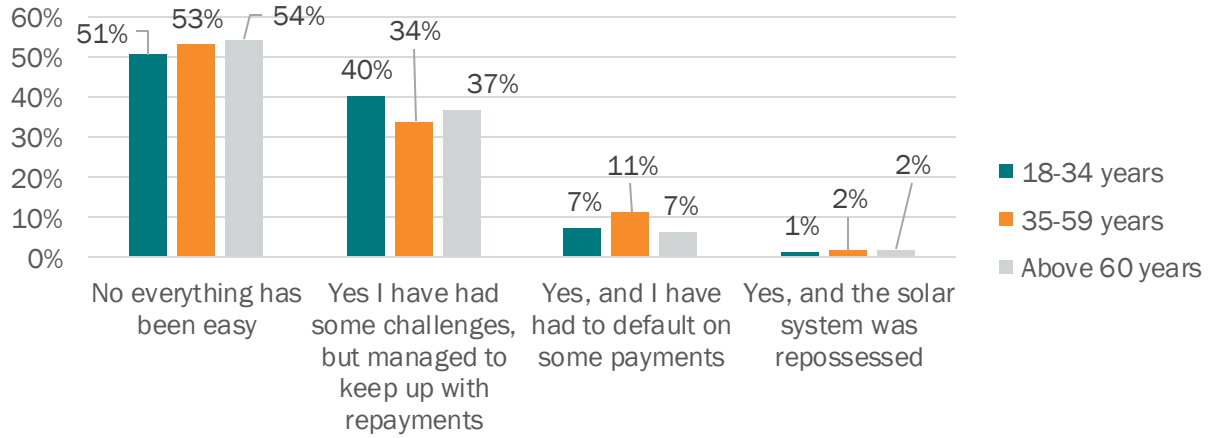
*This is broadly in line with the company-reported statistics of a 6% default rate for customers in the pilot.

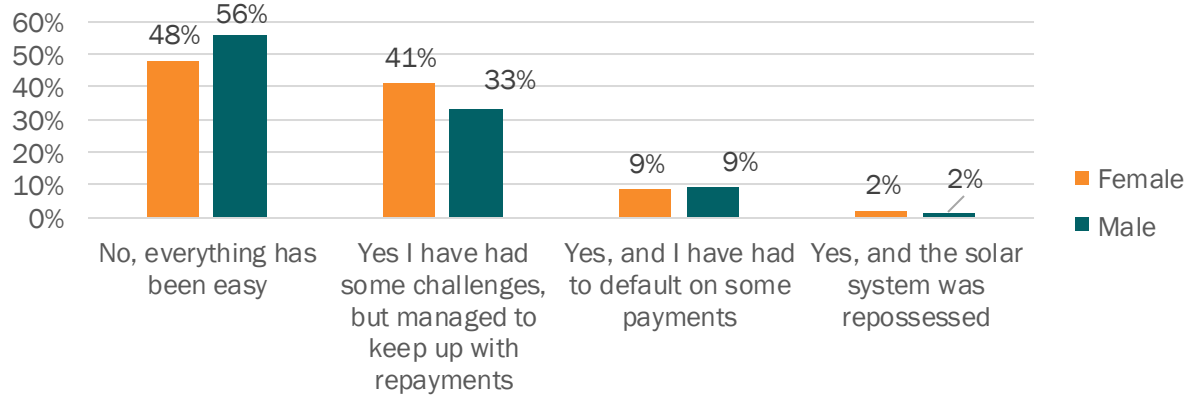


In Uganda, more than a third (36%) of respondents experienced difficulties with payments, and 9% admitted to defaulting on payments*; female and younger customers were slightly more likely to struggle

Have you experienced any difficulties in keeping up with payments for your solar home system?







*This is broadly in line with the company-reported statistics of a 6% default rate for customers in the pilot.

Impact of late repayment and defaults on off-grid solar companies

Assumptions tested

- Late payments have a significant effect on solar companies' working capital and may lead to expensive loans (interest rates of ~20-23%).
- Companies usually factor in 5-10% of the price to account for defaults and possible non-payments, this isn't enough for catastrophic events. This concerns investors.

Findings

- It is the **business' risk profile that affects the ability of getting funding**, as "portfolio at risk" (PAR, defaulters balance divided by total loan portfolio) is a metric that investors look at. Therefore, managing risk is key to businesses.
- No companies mentioned a substantial effect on their working capital as a key consideration.
- One company confirmed that **they factor in defaults in their pricing** which can make the products unaffordable.

Summary of Findings

- Solar companies treated default and repossession in a similar way: 60-90 days of inactivity, customers are in default, 90-120 days of inactivity, the solar system can be repossessed.
- **Solar companies reported that defaults and repossessions have the biggest impact on their profitability**, so they use various means to reduce the likelihood of repossession, including amending payment terms or pausing contracts, downgrading to a more basic package, transfer of ownership.
- **60% of customers surveyed in all three countries experienced challenges in keeping up with payments** or defaulted on payments.
    - Female customers were more likely to experience difficulties with payments than male customers, however they were less likely to default on their payments (by 4% in Senegal) or having their assets repossessed (by 3% in Kenya) .

Lessons

Overall, 33,789 farmers were entitled to insurance compensation. The average payout per customer ranged between $3 and $66

Country	Number of customers insured	Total sum insured ($)	Total premiums ($)	Premiums paid by Shell Foundation ($)	Total payouts ($)	Number of customers receiving payout	Average payout per customer ($)
Senegal	12,401	4,092,330	368,310	184,155 (50%)	238,196	3,585 (29%)	66
Kenya	4,174	306,661	62,118	50,000 (81%)	27,622	1,058 (25%)	26
Uganda	220,000	6,160,000	739,200	307,183 (42%)	91,198	29,146 (13%)	3

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Overall, the pilot was viewed positively; however, affordability of the insurance without subsidy remains a concern. Solar companies have yet to reach a conclusion on the product's viability and intend to implement another pilot and further analysis.

Dealing with payouts

- The payout strategies were still being developed at the time of the interviews; hence, payouts had not been passed on to customers.
- There is some early indication of how payouts may be processed if the company decided to offer the insurance product; this could involve crediting the customer accounts.

Feasibility of the product

- Affordability is a concern for solar companies, especially in highly competitive markets (among the poorest customers), which makes it challenging to pass on the cost of the premium to customers. One company was of the view that the product would not work without a subsidy.
- Concern was raised about the readiness of the insurance market in Senegal, in terms of whether smallholder farmers would be willing to pay for insurance products. Customers have shown some interest in obtaining insurance in Kenya.

Way forward

- Solar companies were contemplating conducting further pilots at different locations and analysis to determine whether to adopt the insurance.
- With regards to the insurance bundle, their key considerations included:
  - Selection of SHS products to include in the bundle
  - Approach to the insurance bundle in cases where not all customers are farmers
  - Strategies to cover the premium and product pricing while maintaining affordability.

Summary of Findings

- **Solar companies did not decide on the payout strategy at the time of the interviews**, therefore the effects of the payouts on smallholder farmers could not be observed.
- **Solar companies questioned the affordability of the bundled insurance for customers.** This reflects their thinking about passing on the additional cost of the premium to the customers in lieu of a subsidy.
- **They are conducting further analysis and are still considering doing a second pilot** at a different location to conclude their opinion on the product's viability.